

CLAIMS

- 5 1. A level gauge (10) for measuring the level of the surface (6) of a product (2) stored in a tank (1), said level gauge including a radar for transmitting microwaves towards said surface (6), for receiving microwaves reflected by said surface and for determining the level based on an evaluation of the time lapsed between the received and the transmitted waves, **characterized in that:**

 - 10 - said level gauge is adapted to transmit and receive said microwaves on at least a first and a second frequency band and

- the center frequency of the second frequency band is at least 1.5 times the center frequency of the first frequency band.
- 15 2. A level gauge according to claim 1, wherein the center frequency of the second frequency band is at least 2 times the center frequency of the first frequency band.
- 20 3. A level gauge according to claim 1 or 2, wherein said radar is coupled to a multiband antenna for transmitting and receiving said waves on said first and said second frequency band and the antenna having a seal at a feed-through- in a wall of said tank, wherein said seal is made to withstand temperature and pressure differences between the interior and the exterior of the tank and to resist chemical affects by products in the tank.
- 25 4. A level gauge according to claim 1 or 2, wherein said radar is coupled to a broadband antenna covering the used frequencies for transmitting and receiving said waves on said first and said second frequency band and the antenna having a seal feed-through- in a wall of said tank, wherein said seal is made to withstand temperature and pressure differences between the interior and the exterior of the tank and to resist chemical affects by products in the tank.
- 30 5. A level gauge according to claim 3, wherein said antenna (4) is one from the group consisting of: a horn antenna, a helix antenna, a patch array multiband antenna, a reflector antenna, a log-periodic antenna.

6. A level gauge according to claim 4, wherein said antenna (4) is one from the group consisting of: a horn antenna, a helix antenna, a patch array multiband antenna, a reflector antenna.
- 5 7. A level gauge according to any of claims 1 or 2, wherein said radar has circuits for generating microwaves in two or more microwave frequency bands and wherein said gauge includes a switching function to allow the radar to operate on any of said frequency bands by switching the radar to operate on a frequency band automatically chosen by an evaluation unit
- 10 8. A level gauge according to claim 1 or 2, wherein said radar is a radar operating on a broad band covering the predetermined frequency bands and provided with selecting means for the choice of frequency band and wherein said gauge includes a switching function to allow the radar to be switched to operate on any of said chosen frequency
- 15 bands in an automatic manner.
9. A level gauge according to claim 3 or 4, wherein the radar of the level gauge includes an RF module (12) for generating and receiving said microwaves.
- 20 10. A level gauge according to claim 6, wherein said gauge (10) includes a control unit (11) and a signal analyzing unit (13).
11. A level gauge according to claim 10, wherein said signal analyzing unit (13) in dependence of a performed analysis of the received microwave signal spectrum is set to
- 25 determine on which frequency band the RF module (12) shall operate.
12. A level gauge according to claim 11, wherein said control unit (11) by means of a control signal from said signal analyzing unit (13) switches the RF module (12) to operate on a predetermined microwave frequency band.
- 30 13. A level gauge according to claim 9, wherein said microwave signal is transmitted from the RF module (12) to the antenna (4) by means of a transmission line (14) consisting of any one from the group of: a coaxial wire, a TEM-line, a microstrip line, a stripline, a twin line.

14. A level gauge according to claim 9, wherein said microwave signal is transmitted from the RF module (12) to the antenna (4) by means of a transmitting line (14) consisting of a wideband or multiband wave guide.

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15. A level gauge according to claim 14, wherein said wave guide is a ridge wave guide.

16. A level gauge according to claim 15, wherein said ridge wave guide has a circular or a rectangular or an elliptical cross section.

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17. A level gauge according to claim 16, wherein said ridge wave guide is at least partly filled with a dielectric material for sealing or that it is provided with a dielectric cover across any cross section of its horn.

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18. A level gauge according to claim 15, wherein said wave guide is provided with one, two or four ridges (43) in order to transmit microwave signals in one or two or circular polarization.

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19. A level gauge according to claim 3 or 4, wherein the sealing of said antenna is a dielectric serving as a sealing between the interior of the tank (1) and the surroundings.

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20. A level gauge according to any of the preceding claims, wherein the first frequency band has a center frequency having a high penetration in an atmosphere prevailing above the surface of the tank (1).

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21. A level gauge according to any of the preceding claims, wherein the second frequency band has a center frequency of a microwave having a narrow beam.
22. A method for measuring the level of the surface (6) of a product (2) stored in a tank (1) comprising the steps of:
- transmitting a microwave signal towards said surface by means of a radar,
 - receiving a microwave signal reflected by said surface by means of said radar,
 - transmitting and receiving said microwave signals on a first frequency band,
 - transmitting and receiving said microwave signals on at least a second frequency band

- setting the center frequency of the second frequency band to more than 1.5 times the center frequency of the first frequency band and
- evaluating the level based on the time lapsed between the corresponding transmitted and received microwave signals.

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23. The method according to claim 22, comprising:

- analyzing in a signal analyzer a first echo spectrum generated and based on the signal transmitted and received on the first frequency band,
- analyzing at least a second echo spectrum generated and based on the signal transmitted and received on the at least second frequency band and
- in dependence of the analysis performed on the microwave spectra automatically setting the radar to work on only one of said frequency bands for determining the level based on the level calculation performed for the frequency band to which the radar is set.

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24. The method according to claim 22, comprising:

- analyzing in a signal analyzer a first echo spectrum generated and based on the signal transmitted and received on the first frequency band,
- analyzing at least a second echo spectrum generated and based on the signal transmitted and received on the at least second frequency band and
- in dependence of the analysis performed on the microwave spectra automatically setting the radar to work on all of said frequency bands for determining the level based on an average of the calculation of the level performed for each of said frequency bands.

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